

make known to us. Indian shooting is well treated by Colonel Percy, who goes very fully into the subject. It is, indeed, an ample one, and Colonel Percy enumerates no less than fifty-three animals to be included in the category of big game by the fortunate sportsmen of India. The second volume concludes with good advice about camps, transport, rifles, and ammunition, and with a few hints on taxidermy, showing the way in which the larger animals should be skinned and their heads set up as sportsmen's trophies.

In concluding our notice of this attractive work, we may be permitted again to call notice to the illustrations, which, with few exceptions, are of a high degree of excellence. Two of these, by the kind permission of the publishers, we reproduce on the present occasion. The first of them represents a scene in British East Africa, between Teita and Taveta, in the Kilima-njaro district, where (in September 1886) the country was "literally crawling" with zebra, hartebeest, impala, oryx, and Grant's antelope, besides eland and giraffe, and an occasional steinbok and wart-hog." In those days Taveta was correctly designated the "Hunters' Paradise." The second illustration shows us the haunt of the Spanish ibex, of which we have already spoken.

Before concluding our notice of what will no doubt quickly and deservedly become the big-game-shooters' favourite handbook, we venture to call attention to what is probably a slight slip on the part of Mr. Philipps-Wolley. General Richard Dashwood, than whom there can be no better authority on the subject, has commented, in an article in *Land and Water* (March 24, 1894), rather severely on some of Mr. Philipps-Wolley's statements regarding the caribon and moose of North America. It is no doubt incorrect to say that caribon and moose feed upon the same food. As explained by General Dashwood, their tastes are very different. It is also an error to describe the "call-cry" of the female moose as a roar. General Dashwood's experienced ear teaches him to describe it as a "beautiful clear note, rising and falling with a sort of entreasy in the tone and a soft grunt at the end."

POPULARISING SCIENCE.

"POPULAR science," it is to be feared, is a phrase that conveys a certain flavour of contempt to many a scientific worker. It may be that this contempt is not altogether undeserved, and that a considerable proportion of the science of our magazines, school text-books, and books for the general reader, is the mere obvious tinctured by inaccurate compilation. But this in itself scarcely justifies a sweeping condemnation, though the editorial incapacity thus evinced must be a source of grave regret to all specialists with literary leanings and with the welfare of science at heart. The fact remains that in an age when the endowment of research is rapidly passing out of the hands of private or quasi-private organisations into those of the State, the maintenance of an intelligent exterior interest in current investigation becomes of almost vital importance to continual progress. Let that adjective "intelligent" be insisted upon. Time was when inquiry could go on unaffected even by the scornful misrepresentations of such a powerful enemy as Swift, because it was mainly the occupation of men of considerable means. But now that our growing edifice of knowledge spreads more and more over a substructure of grants and votes, and the appliances needed for instruction and further research increase steadily in cost, even the affectation of a contempt for popular opinion becomes unwise. There is not only the danger of supplies being cut off, but of their being misapplied by a public whose scientific education is neglected, of their being deflected from investigations of certain, to

those of doubtful value. For instance, the public endowment of the Zetetic Society, the discovery of Dr. Platt's polar and central suns, or the rotation of Dr. Owen's Bacon-cryptogram wheel, at the expense of saner inquiries might conceivably and very appropriately result from the specialisation of science to the supercilious pitch.

It should also go far to reconcile even the youngest and most promising of specialists to the serious consideration of popular science, to reflect that the acknowledged leaders of the great generation that is now passing away, Darwin notably, addressed themselves in many cases to the general reader, rather than to their colleagues. But instead of the current of popular and yet philosophical books increasing, its volume appears if anything to dwindle, and many works ostensibly addressed to the public by distinguished investigators, succeed in no notable degree, or fail to meet with appreciation altogether. There is still a considerable demand for popular works, but it is met in many cases by a new class of publication from which philosophical quality is largely eliminated. At the risk of appearing impertinent, I may perhaps, as a mere general reader, say a little concerning the defects of very much of what is proffered to the public as scientific literature. As a reviewer for one or two publications, I have necessarily given some special attention to the matter.

As a general principle, one may say that a book should be written in the language of its readers, but a very considerable number of scientific writers fail to realise this. A few write boldly in the dialect of their science, and there is certainly a considerable pleasure in a skilful and compact handling of technicalities; but such writers do not appreciate the fact that this is an acquired taste, and that the public has not acquired it. Worse sometimes results from the persistent avoidance of technicality. Except in the cases of the meteorologist, archæologist, and astronomer, who are relatively free from a special terminology, a scientific man finds himself at a great disadvantage in writing literary English when compared with a man who is not a specialist. To express his thought precisely he gravitates towards the all too convenient technicality, and forbidden that, too often rests contented with vague, ambiguous, or misleading phrases. It does not follow that, because, what from a literary standpoint must be called "slang," is not to be used, that the writer is justified in "writing down" as if to his intellectual inferiors. The evil often goes further than a lack of precision. Out of a quite unwarrantable feeling of pity and condescension for the weak minds that have to wrestle with the elements of his thought, the scientific writer will go out of his way to jest jests of a carefully selected and most obvious description, forgetting that whatever status his special knowledge may give him in his subject, the subtlety of his humour is probably not greatly superior, and may even be inferior to that of the average man, and that what he assumes as inferiority in his hearers or readers is simply the absence of what is, after all, his own intellectual parochialism. The villager thought the tourist a fool because he did not know "Owd Smith." Occasionally scientific people are guilty of much the same fallacy.

In this matter of writing or lecturing "down," one may even go so far as to object altogether to the facetious adornment of popular scientific statements. Writing as one of the reading public, I may testify that to the common man who opens a book or attends a lecture, this clowning is either very irritating or very depressing. We respect science and scientific men hugely, and we had far rather they took themselves seriously. The taste for formal jesting is sufficiently provided for in periodicals of a special class. Yet on three occasions recently very considerable distress has been occasioned the writer by such mistaken

efforts after puerility of style. One was in a popular work on geology, where the beautiful problems of the past of our island and the evolution of life were defaced by the disorderly offspring of a quite megatherial wit—if one may coin such an antithesis to “ethereal.” One jest I am afraid I shall never forget. It was a Laocoon struggle with the thought that the huge subsidiary brains in the lumbar region of *Stegosaurus* suggested the animation of Dr. Busby’s arm by the suspicion of a similarly situated brain in the common boy. The second disappointment was a popular lecture professing to deal with the Lick Observatory, and I was naturally anxious to learn a little of the unique appliances and special discoveries of this place. But we scarcely got to the Observatory at all. We were shown—I presume as being more adapted to our intelligence—numerous lantern-slides of the road to the Lick Observatory, most of them with the “great white dome” in the distance, other views (for comparison probably) with the “great white dome” hidden, portraits of the “gentlemen of the party on horseback,” walks round the Observatory, the head of an interesting old man who lived in a cottage near, the dome by moonlight, the dome in winter, and at last the telescope was “too technical” for explanation, and we were told in a superior tone of foolish things our fellow common people had said about it. For my own part, I really saw nothing very foolish in a lady expecting to see houses on the moon. My third experience was ostensibly a lecture on astronomy, but it was really an entertainment—and a very fair one—after the lines of Mr. Grossmith’s. “Corney Grain in Infinite Space” might have served as a title. It was very amusing, it was full of humour, but as for science, the facts were mere magazine *clichés* that we have grown sick of long ago. And as a pretty example of its scientific value I find a newspaper reporter, whose account is chiefly “(laughter)” with jokes in between, carried away the impression that Herschel discovered Saturn in the reign of George the Third.

Now this kind of thing is not popularising science at all. It is merely making fun of it. It dishonours the goddess we serve. It is a far more difficult thing than is usually imagined, but it is an imperative one, that scientific exponents who wish to be taken seriously should not only be precise and explicit, but also absolutely serious in their style. If it were not a point of discretion it would still be a point of honour.

In another direction those to whom the exposition of science falls might reasonably consider their going more carefully, and that is in the way of construction. Very few books and scientific papers appear to be constructed at all. The author simply wanders about his subject. He selects, let us say, “Badgers and Bats” as the title. It is alliterative, and an unhappy public is supposed to be singularly amenable to alliteration. He writes first of all about Badger A. “We now come,” he says, “to Badger B”; then “another interesting species is Badger C”; paragraphs on Badger D follow, and so the pavement is completed. “Let us now turn to the Bats,” he says. It would not matter a bit if you cut any section of his book or paper out, or shuffled the sections, or destroyed most or all of them. This is not simply bad art; it is the trick of boredom. A scientific paper for popular reading may and should have an orderly progression and development. Intelligent common people come to scientific books neither for humour, subtlety of style, nor for vulgar wonders of the “millions and millions and millions” type, but for problems to exercise their minds upon. The taste for good inductive reading is very widely diffused; there is a keen pleasure in seeing a previously unexpected generalisation skilfully developed. The interest should begin at its opening words, and should rise steadily to its conclusion. The fundamental principles of construction that underlie such stories as Poe’s

“Murders in the Rue Morgue,” or Conan Doyle’s “Sherlock Holmes” series, are precisely those that should guide a scientific writer. These stories show that the public delights in the ingenious unravelling of evidence, and Conan Doyle need never stoop to jesting. First the problem, then the gradual piecing together of the solution. They cannot get enough of such matter.

The nature of the problems, too, is worthy of a little attention. Very few scientific specialists differentiate clearly between philosophical and technical interest. To those engaged in research the means become at last almost as important, and even more important than the end, but apart from industrial applications, the final end of all science is to formulate the relationship of phenomena to the thinking man. The systematic reference of *Calceola*, for instance, *Theca*, the Lichens, the Polyzoa, or the Termites, is an extremely fascinating question to the student who has just passed the elementary stage, and so too is the discussion of the manufacture and powers of telescopes and microscopes; morphological questions again become at last as delightful as good chess, and so do mathematical problems. But it must be remembered that morphology, mathematics, and classification are from the wider point of view mere intellectual appliances, and that to the general reader they are only interesting in connection with their end. To the specialist even they would not be interesting if he had not first had their end in view. The fundamental interest of all biological science is the balance and interplay of life, yet for one paper of this type that comes to hand there are a dozen amplified catalogues of the “Cats and Crocodiles” description. I find again, presented as a popular article, a long list of double stars with their chief measurements. Now, to a common man one double star is as good as a feast. Again, the botanist, asked to write about leaves, will get himself voluminously entangled in the discussion whether an anther is a lamina, or in an exhaustive and even exuberant classification of simple and compound, pinnate and palmate, and the like, making great points of the orange leaf and the barberry. But the kind of thing we want to have pointed out to us is *why* leaves are of such different shapes and so variously arranged. It is a thing all people who are not botanists puzzle over, and a very pretty illustrated paper might be written, and remains still to be written, linking rainfall and other meteorological phenomena, the influence of soil upon root distribution and animal enemies, with this infinite variety of beautiful forms.

Enough has been said to show along what lines the genuine populariser of science goes. There are models still in plenty; but if there are models there are awful examples—if anything they seem to be increasing—who appear bent upon killing the interest that the generation of writers who are now passing the zenith of their fame created, wounding it with clumsy jests, paining it with patronage, and suffocating it under their voluminous and amorphous emissions. There is, I believe, no critical literature dealing generally with the literary merits of popular scientific books, and there are no canons for such criticism. It is, I am convinced, a matter that is worthy of more attention from scientific men, if only on the grounds mentioned in my opening paragraphs.

H. G. WELLS.

ON THE NEW BUILDINGS FOR THE ST. ANDREWS (GATTY) MARINE LABORATORY.

THAT St. Andrews had not one of the oldest marine laboratories was the result of an accident. Nevertheless it has the oldest marine laboratory in Britain, since it was opened early in 1884, though since 1882 the practical laboratory in the College had been used for this purpose; and it could not well be otherwise, since it was